for the rapid diagnosis of tuberculosis, has recently been developed that potentially allows a diagnosis of tuberculosis to be made within hours. The application of this new technology is expected to greatly assist physicians and public health programs in the diagnosis, management, and contact investigations of persons with tuberculosis.

Nucleic acid amplification testing is a rapid technique of amplifying either RNA or DNA that allows the creation of millions of identical copies of a specific genetic sequence that then serve as markers for the presence of organisms in biologic specimens. Although polymerase chain reaction is the most well-known NAAT, many others have been developed. Gen-Probe's *M tuberculosis* direct test (MDT), one version of NAAT, was recently the first to be approved by the Food and Drug Administration for the detection of *M tuberculosis* in sputum specimens that are smear-positive for acid-fast bacilli (AFB). It is expected that other manufacturers' tests will be approved within the next two years. The MDT is commercially available and requires only six hours to perform, allowing a rapid turnaround time of testing results. The performance of the Gen-Probe MDT has been well documented and has yielded excellent results compared with traditional smear and culture techniques used in diagnosing tuberculosis. The average sensitivity and specificity of the test for all published trials are 87% and 99%, respectively, resulting in a positive predictive value of 95% and a negative predictive value of 98%. This compares with the 54% sensitivity for fluorochrome stain, the rapid diagnostic test currently used to detect AFB. In our clinic, the fluorochrome stain misses the 46% of patients with tuberculosis with negative smears who are ultimately positive on culture, whereas NAAT misses only 18% of patients with cultures positive for tuberculosis. The sensitivity of NAAT for AFB smear–positive specimens (99%) is higher than that for AFB smear–negative specimens (56%).

Now that a NAAT for *M tuberculosis* is readily available, questions have been raised as to how to apply it most effectively in a clinical setting. It seems clear that with a specificity and positive predictive value approaching 100%, it is a reliable tool for the diagnosis of tuberculosis in a patient with a positive AFB smear. Although it is only 56% sensitive in AFB smear–negative specimens, a positive NAAT in a patient with a negative smear provides an early clue to the presence of active tuberculosis. The diagnosis of tuberculosis in these AFB smear–negative patients might otherwise be delayed, especially if they have minimal clinical or radiographic findings. Starting treatment immediately for these smear-negative patients avoids the potential of communicability developing during the interval of as long as eight weeks while awaiting culture results.

Nucleic acid amplification testing has limitations. About 18% of patients with culture-positive tuberculosis will be missed with this test. There are two explanations: few organisms in the submitted specimen and specimens that contain inhibitors. Controls can be used to rule out the presence of inhibitors for smear-positive NAAT-negative specimens. It is important not to withhold treatment in a patient who has clinical features consistent with active tuberculosis just because the NAAT is negative. It is always prudent to await final culture results and to assess the patient's response to treatment. It is appropriate to initiate the treatment of active tuberculosis in a smear-negative patient with a positive NAAT even if there is minimal clinical and radiographic evidence for the disease. Studies have shown that more than 90% of these patients will ultimately grow *M tuberculosis* in culture. Those patients who do not produce a positive culture may still have active tuberculosis but with an insufficient number of viable organisms to produce a positive culture in the laboratory. In these cases, a diagnosis of tuberculosis might otherwise be missed without adjunctive NAAT testing.

In summary, NAAT is becoming an important tool to aid in the diagnosis of tuberculosis, but it does not replace clinical evaluation, conventional AFB smears, and culture techniques. It has the ability to diagnose tuberculosis rapidly in 99% of AFB smear–positive specimens and in 65% of AFB smear–negative specimens. It is appropriate to initiate treatment based on the results of this test but not to stop treatment if results are negative until culture results become final. The use of NAAT has proved helpful to decision making in our public health practice. The test can be used as an early diagnostic tool to determine if an infection is caused by *M tuberculosis*. If the smear is positive, NAAT is particularly helpful in guiding decisions about contact investigations and the need for respiratory isolation in patients who may be infected with a *Mycobacterium* species other than tuberculosis. If the smear is negative, NAAT allows earlier treatment of tuberculosis other than waiting for culture. It has proved to be an effective tool in the diagnosis and management of tuberculosis. We think it will also prove to be effective in responding to the global epidemic of tuberculosis.

JODY MEADOR, MD
DOUGLAS MOORE, PhD
PENNY WEISMULLER, DrPH
Santa Ana, California

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Latex Allergy

THE PROBLEM OF cutaneous and respiratory reactions to latex antigen(s) is one that has generated considerable attention among allergists, anesthesiologists, surgeons, occupational medicine practitioners, and health care professionals in general. Whether the widely held perception that the prevalence of glove-related health prob-

lems is increasing among health care workers is due to heightened practitioner awareness or is a real phenomenon cannot be addressed directly with existing surveillance data. Nevertheless, the increasingly routine use of latex gloves as part of universal precautions, as well as the use of mass-produced examination gloves with relatively high antigen content, are factors pointing to an increased exposure potential—that is, more health care workers (and others) are wearing latex gloves and are doing so for a greater portion of their workweek.

Allergists and dermatologists first described immediate-onset latex-associated skin reactions in 1980, labeling them as immunoglobulin E–mediated contact urticaria. Subsequently, numerous cases of angioedema, anaphylaxis, rhinoconjunctivitis, and bronchospasm have been ascribed to latex allergy. The Food and Drug Administration did much to increase awareness of this issue when, in 1991, it issued a bulletin describing anaphylactic reactions to rubber-tipped barium enema catheters. This information encouraged anesthesiologists to investigate hitherto-unexplained intraoperative hypotensive events and to conclude that, in some cases, anaphylactic reactions to surgeons' gloves may be responsible. Issues of nonmedical latex exposure (for example, to condoms, chewing gum, and balloons) and of cross-reactivity with some foods (bananas, avocados, kiwi fruit, chestnuts, and others) have also been identified. Considerable effort has subsequently been invested in identifying the responsible antigenic determinants from the sap of the rubber tree, *Hevea brasiliensis*, and in perfecting skin test antigens and in vitro test reagents.

In the workplace—particularly in hospitals—latex allergy can be a vexing problem. First, latex-related skin conditions must be distinguished from more commonly occurring conditions, such as nonspecific glove-related exacerbation of dyshidrotic eczema and atopic dermatitis, and from less common disorders, such as allergic contact dermatitis from rubber accelerators or antioxidants. In making this distinction, the timing and morphology of skin reactions may be helpful, and in vitro diagnostic tests can help confirm latex allergy as part of a diagnostic algorithm. Nevertheless, specialty consultation for skin-prick or patch testing may be needed. For persons with respiratory symptoms, a similar approach is used, with the addition of peak flow measurements to document cross-workshift decrements in pulmonary function.

Once a latex allergy is diagnosed, the affected person must be supplied with appropriate gloves. For a person with atopic dermatitis or dyshidrotic eczema, the use of cloth glove liners is far more important than substituting glove materials. For a person with true latex skin allergy, substitute gloves are available fabricated from a variety of materials, including vinyl (polyvinyl chloride), nitrile (polynitrile), polychloroprene, and substituted polystyrene polymers. The most challenging situation is posed by persons with substantial respiratory symptoms. Cornstarch or talc dust on powdered latex gloves acts as an airborne antigen carrier and can therefore passively trigger respiratory symptoms in persons not wearing such gloves. Thus, in a hospital or clinic environment, it would be desirable to replace all powdered latex gloves with unpowdered, in addition to providing sensitized persons with nonlatex substitutes.

The major barrier to such a strategy at this time is economic. Although no substantial cost differential exists for replacing powdered latex "examination" (nonsterile) gloves with their unpowdered counterparts, a large differential (5 to 6 times the cost) exists for "surgeons'" (sterile) gloves. To dictate that all personnel in a given facility wear either unpowdered latex or nonlatex gloves, whether the persons are latex sensitized or not, may be an expensive step. On the other hand, excluding health care professionals from their customary employment may be an even costlier proposition. Under the Americans with Disabilities Act of 1990, a "qualified individual with a disability" has a right to "reasonable accommodation" with respect to working conditions, while "essential functions" of the job cannot pose an "imminent risk of harm." Accordingly, prudent occupational health practitioners carefully document any decision-making processes that affect the initial or continuing employment status of latex-sensitized workers. In such a climate, it is only a matter of time before market forces eliminate the cost differential between powdered latex surgeons' gloves and their unpowdered (or nonlatex) counterparts.

DENNIS SHUSTERMAN, MD, MPH
San Francisco, California

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Decreasing Work Disability From Asthma

ASTHMA PREVALENCE is increasing, and many cases have occupational and environmental causes. Unlike many other respiratory problems, it affects people during their active working life and can substantially affect their ability to work. The overall cost to patients and employers is great. Public health and clinical approaches can decrease its burden. A notable proportion of asthma is caused by work; this is known as "occupational asthma." It is more frequently of nonoccupational origin, but is aggravated by occupational exposure; this is known as "work-aggravated asthma."

There are two major categories of occupational asthma: "with latency" (delay between exposure and onset) and "without latency." Occupational asthma with latency often depends on the development of antibodies and therefore requires time and repeated exposures to a specific antigenic